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(19) (CA) **APPLICATION FOR CANADIAN PATENT** (12)

(54) Adjustable Waist Feature for Adult Briefs

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(57) 22 Claims

Notice: This application is as filed and may therefore contain an
incomplet specification.



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ABSTRACT

In a brief such as an infant diaper, toddler training pants, or similar disposable articles for adult use, the problem of leakage of waste in the lower spinal area of the wearer (due to the concavity in this portion of the human form) is addressed by providing a projection means for projecting or bunching up the liquid absorbent core material of the brief in this area. This projection can be effected in numerous ways such as by providing pleating arrangements, means for arching the brief in the required area or means for bunching up the absorbent core of the brief.

This invention relates to a new or improved brief. The invention is applicable to such briefs whether designed for the use of infants, children or adults, and as used herein the expression "brief" is intended to encompass all such articles including diapers for infants and training pants for toddlers and other similar undergarments.

10 Briefs as in use today, including incontinence briefs for adults, are generally of the disposable type and comprise an outer layer of flexible liquid-impervious plastic material possibly reinforced such as practiced on infant
diaper frontal area, a liquid-absorbing core layer, typically of a bulky, fluffed fiber construction, and an inner layer for contact with the skin of the user. With such briefs the problem of leakage from the edges of the leg openings and the waist opening has long been recognized, and various steps have been taken to counteract it. Typically, these have involved incorporating into the edge regions of the diaper elastic ribbon which will in use effect some constriction of the
20 diaper at the leg and waist openings, as for example is shown in U.S. 4,981,480 Gaudet et al. While Gaudet et al. and others have recognized the problem of leakage from the waist such diapers and briefs, it is believed that none of the prior art solutions has successfully overcome this problem.

The aim of the present invention is to provide a construction of diaper or incontinence brief that will significantly reduce if not eliminate the possibility of leakage in the lower spinal region of the user. Leakage in this area is particularly troublesome since it cannot be overcome merely by lasticizing the waist. There is a

concavity in this part of the human form, and mere
elastication will do little if anything to prevent leakage
through this concavity.

The present invention provides: a brief comprising
an outer layer of flexible liquid-impervious material covered
on the inner side by a core layer of liquid-absorbent material
that extends over the major portion of said impervious outer
layer, said brief comprising a relatively narrow crotch area
on opposite sides of which are relatively broader front and
10 rear panels each of which terminates in a transverse edge that
in use forms part of a waistband of the brief, said brief
being adapted in use to snugly surround the pelvic regions of
a wearer, said rear panel including projection means to urge a
portion of the absorbent core layer of the brief into more
intimate contact with the lower spinal region of the wearer
and thereby reduce the possibility of leakage of bodily wastes
from the brief in that region.

Accordingly, with the brief of the invention,
leakage along the concave spinal region of the wearer is
20 reduced or prevented by effectively filling this concave
region with the material of the core layer. Numerous
expedients can be employed to achieve this effect, and some of
these are described below and illustrated in the accompanying
drawings.

A) The projection means can be designed to effect a
local gathering or bunching of the material of the core layer
e.g. in a direction generally parallel to the waist band of
the brief, and thus increase the effective thickness of the
core layer in the concave region.

B) The projection means can be designed to effect formation of one or more pleats in at least the core layer in the lower spinal region. Where two pleats are provided they will preferably be positioned adjacent each other but on opposite sides of the center of the spinal region. Adjustable tape, e.g. of adhesive, can be provided on the outer layer of the brief to secure the pleat, once formed, in position. Multiple pleats can also be provided.

10 C) The projection means may be in the form of a resilient, bendable but substantially non-compressible element that extends transverse to the spinal region, with means for securing this element in a configuration that is bowed into the concave region.

D) A bunching strip can be threaded through the brief in the desired region, the bunching strip being operable to bunch and gather the absorbent core layer in the desired location.

20 The brief may be provided in flat form to be wrapped around the user's pelvic region and secured thereon at the time of use, or may be provided in made-up form with waist and leg openings e.g. as in the case of training pants for toddlers.

Briefs in the form of disposable diapers frequently include fastening means such as adhesive tapes to secure the diaper on the body of the user. Such tapes may be in many forms as known in the art. Such tapes may have one end secured to the rear of the diaper and the other end contacting a release surface from which it can be peeled at the time of use for re-attachment to the front of the diaper. Various

adhesives and other means of attachment for the tapes may be employed, and in particular it is possible to use an adhesive which while providing a strong bonding to the diaper nevertheless permits peeling and re-attachment of the tapes so that they can be adjusted after use.

The invention will further be described, by way of example only, with reference to the embodiments shown in the accompanying drawings wherein:

10 Figure 1 is a somewhat schematic plan view of a flat form brief, which in this case is a diaper, in accordance with the invention;

Figure 2 is a fragmentary sectional view to a larger scale taken on the line 2-2 in Figure 1;

Figure 3 is a perspective view showing the diaper of Figure 1 in use;

Figure 4 is a view corresponding to Figure 2, but showing the diaper in the configuration of use;

Figure 5 is a fragmentary plan view of a second embodiment of brief;

20 Figure 6 is a view as seen in the direction of the arrow 6 in Figure 5;

Figure 7 is a fragmentary perspective view to an enlarged scale showing the configuration in use of the embodiment of Figures 5 and 6;

Figure 8 is an enlarged view corresponding to Figure 6 showing the brief in the use position;

Figure 9 is a view corresponding to Figure 5 but showing a brief having an alternate fastening system;

Figure 10 is a view corresponding to Figure 9

showing a brief having yet another projection system;

Figure 11 is a sectional view taken on the line 11-11 of Figure 10;

Figure 12 is a view showing the brief of Figure 10 in the use position;

Figure 13 is a view in the direction of the arrow 13 in Figure 12;

Figure 14 is a partial view corresponding to Figure 12 but as seen from the opposite (i.e. inner) side;

10 Figure 15 is a perspective view of an alternate embodiment of brief shown partially formed into the use position;

Figure 16 is a fragmentary plan view of a portion of a brief showing an alternate projection or gathering means; and

Figure 17 is a view in the direction of the arrow A in Figure 16;

Figure 18 is a fragmentary plan view showing the arrangement of Figure 16 in the gathered position of use;

20 Figure 19 is a fragmentary sectional view corresponding to Figure 2 showing a presently preferred embodiment of the brief;

Figure 20 is a partial perspective view showing the arrangement of Figure 19 in the use position;

Figure 21 is a view corresponding to Figure 19 showing the use position;

Figure 22 is a fragmentary sectional view corresponding to Figure 2 showing yet another embodiment; and

Figure 23 is a view corresponding to Figure 2

showing the embodiment in the us position.

The diaper 20 of Figures 1 through 4 is provided in a basically flat form of somewhat hourglass shape as seen in Figure 1. The diaper is of flexible material and includes an outermost layer 21 of flexible, liquid-impervious plastic material such as a polyethylene film, an internal layer 22 which is adapted to contact the skin of the user and which is of a liquid pervious material, and a relatively thick core layer 23 of liquid-absorbent material. As seen in Figure 1 the diaper has opposed edges 24, 25 (which in use will form rear and front portions respectively of the waist of the diaper) and longitudinal edges 26 which are centrally recessed in the crotch area 27, the recessed regions 28 in use defining the leg openings of the diaper. Additionally the diaper includes fastening means such as adhesive strips 29 on opposite sides of the rear edge 24 and adapted in use to be adhered to the outer layer 21 in the region of the front edge 25 to secure the diaper in position on a user. As described thus far, the diaper is of conventional form, and may also include many other features as known in the art, for example elasticized areas in the waist or leg opening regions etc.

The diaper 20 includes means to counteract leakage of bodily waste from the lower back region of the wearer when the diaper is in use, and to this end is provided with a projection means in the form of a strip arrangement 32 attached to the outer layer 21 somewhat below the rear edge 24 in a position where it overlies part of the core 23 which, as shown in Figure 1 does not extend as far as the edges of the diaper. As is most clearly seen in Figures 2 and 4, the

projection means comprises an elongate rectangular strip of adhesive coated flexible plastic material 33 extending generally transversely. Whereas on end portion 34 is firmly secured to the outer layer 21, the remainder of the strip 33 although coated with adhesive, is not strongly affixed to the outer layer 21, but rather is separated therefrom by a release surface 36. Thus, although the strip 33 may lightly adhere to the release surface 36, it is readily peelable from the release surface by means of a fingerlift 35 at its second end (as indicated by the arrow in Figure 2) at the time of use.

Before the diaper has been fitted to the wearer and secured by the adhesive strip fasteners 29 in the use position as shown in Figures 3 and 4, the strip arrangement 32 can be actuated to provide the desired projection effect by forming a pleat 37. This is done by first peeling the finger lift 35 at the second end of the strip from the release surface 36 to the full extent of the latter, then manually forming the pleat 37 from the material of the diaper including the core layer 23 so that in the central region it is folded over as shown in Figure 4 (and is thus in this localized region greatly increased in its effective thickness) and then re-attaching the end 35 of the strip 33 to the outer layer 21 of the diaper at a location 38 such as to hold the diaper in a width contracted configuration so that the excess folded over diaper material of the pleat 37 remains in the central spinal area of the diaper. The adhesive on the inner side of the strip 33 is such that, although the strip can be easily peeled from the release surface 36, it nonetheless will form a firm and secure bond with the material of the outer layer 21 when re-attached

thereto as indicated in Figure 4. Suitable adhesives for this purpose are well known to those skilled in the art and need not be detailed her in.

The strip 33 may be of any suitable flexible material such as plastic film but should of course have sufficient strength as to resist undesired stretching deformation when attached as shown in Figure 4, since it is important to ensure that the pleat 37 is maintained. In Figure 4, the curvature of the spinal region of the lower back area of the user is represented by the chain dotted line 39 and defines a substantial concavity. By virtue of the pleated arrangement shown however the volume of diaper material is effectively increased, increasing the diaper thickness in this region so as to fill this concavity.

The extent of the concavity is perhaps exaggerated in Figure 4 and in practice the folded over pleat 37 will usually be somewhat compressed between the spine of the wearer and the strip 33, and thus will be able to expand and contract to accommodate movement of the body of the wearer, and maintain an effective leakage prevention in this area. Indeed the nature of the material of the diaper, and in particular the core layer 23, is such that the material of the pleat 37 is very readily deformed and compressed and in use may have a configuration that is quite unlike what is seen in Figure 4. The important point is that there is sufficient excess of diaper material in the central region to provide the desired projection effect. It will be understood that the concept illustrated in Figure 1 to 4 can be used to form two or more pleats in th desired area, or to form pleats at other

locations if desired.

The effect of increasing the thickness of a diaper or brief in the lower back region of the wearer can be accomplished in many different ways, and an alternative arrangement is illustrated in Figures 5, 6, 7 and 8. The diaper or brief 40 as seen in these figures is not illustrated in any detail, and in construction may be generally similar to the diaper shown in Figures 1 to 4. However it differs therefrom by the inclusion of a modified strip arrangement 42 which is designed to form a double pleat as will now be described. A strip 43 of flexible but non-stretching plastic tape material has end portions 44 and 45 that are releasably attached to the outer layer 41 of the diaper, as through the use of release surfaces or tapes 46 (see Figure 6). In the not adjusted condition shown in Figures 5 and 6 the tape strip 43 is contained entirely within the central region B of the flat brief. At the time of use, the ends 44, 45 of the tape strip are in turn peeled from the release surfaces, the material of the brief is gathered and thickened to produce corresponding pleats 47, 48 and the tape ends 44, 45 are re-attached and adhered to the outer layer 41 in the appropriate lateral regions A thereof. Both ends of the tape strip 43 may include a fingerlift, as shown at end 45, to facilitate peeling of the tape ends.

As with the previously described embodiment, the embodiment of Figures 5 to 8 in use effects a central projection of the material of the brief inwardly towards the spinal region of the body of the user. As seen in Figure 8, in the condition of use the release surfaces 46 which remain

in their original positions on the outer layer 41 of the diaper now are folded over and lie within the pleated areas 47, 48.

The diaper or brief 50 schematically and partially shown in Figure 9 is similar to that of Figures 5 to 8 but has a somewhat modified pleat retaining arrangement. It includes a strip 53 having a central part 53a that is securely fastened to the outer layer 51, and has end portions 54, 55 forming part of a mechanical fastening system the corresponding parts 10 56 of which are positioned at desired laterally spaced locations on the outer layer 51. As shown, the mechanical fastening system is a hook and loop fastener, the parts 54, 56; 55, 56 of which are engaged after folding of the diaper to form a pair of pleats as described above in relation to Figures 7 and 8. The strip 53 can be of any suitable flexible material as described above, or alternately in this or in the preceding embodiments the strip can be designed to have a predetermined degree of elasticity.

20 In the embodiment of Figures 10 to 14 the means for effecting projection of the diaper or brief material in the spinal location comprises a strip of generally stiff semi-rigid yet flexible material 62, e.g. of cardboard, plastic or metal, fixed to the outside of the brief 60 and a strip 63 one end 64 of which is adhesively or otherwise securely fastened to the outer layer 61 of the brief and the other end 65 of which can be peeled or removed from the strip 62 and, after the latter has been formed into an arched or bowed configuration as shown in Figures 12 and 13, can be attached to the outer layer 61 as shown to maintain the strip 62 and the

associated region of the brief in the bowed configuration by the bending resistance of the strip 62 so that the diaper or brief will project inwardly into the concave region at the spine of the user. As indicated in Figure 14, the strip 62 is positioned some distance below the waistband area 66 in a location where it overlies the material of the absorbent core 67.

Figure 15 shows a diaper or brief 70, which may in fact correspond to any of the described embodiments, shown in partially formed configuration prior to completion of its wrapping around the pelvic region of the user (not shown). It will be seen that the strip arrangement 72 (which may essentially be of any of the described types) is spaced a substantial distance below the waist band region 68 so that it substantially completely overlies (and preferably is surrounded above and below) by regions of the absorbent core 71. This is in contrast to prior art briefs wherein attempts to control leakage are essentially confined to the waist region 68 where there is no absorbent core. Leakage from this area of the back of the brief is a serious problem for bedridden patients, and prior art attempts to alleviate it have not been successful.

Yet another arrangement for effecting gathering of the material of the absorbent core is seen in Figures 16 and 17 in which the diaper or brief 80 has on the rear part thereof spaced below the waist band a bunching strip or draw cord 82.

The draw cord comprises an elongate flat flexible bow strip 83 which lies against the outer layer 81 of the

diaper or brief and is firmly adhered thereto at discrete spaced locations defined by the lines 84. A pull strip 85 is fixed at one end 86 to the corresponding end of the bow strip 83, and over the remainder of its length lies against the bow strip 83, its opposite end providing a projecting tab 87 that extends beyond the bow strip 83 and is manually graspable.

Adjacent this tab 87 the pull strip 85 has an adhesive coated area 90a which is lightly adhered to the confronting part of the bow strip 83, e.g. by the use of a release coating or the like. As seen in Figure 17 the pull strip 85 is narrower than the bow strip 83, and is guided against the latter by a series of spaced flat loops 88 or a further bow strip (not shown) the ends 89 of which are attached to the bow strip 83 at spaced apart locations above and below the pull strip 85.

Thus as shown, prior to use the draw cord 82 lies flatly against the outer surface 81. At the time of use the tab 87 is peeled back to free the pull strip adhesive area 90a from the bow strip 83, and the tab 87 is then pulled strongly (to the left as seen in Figures 16 and 17) to draw the entire pull strip 85 to the left, including the end 86 that is fixed relative to the brief, and thus to effect a contraction or gathering resulting in a projection outwardly of the corresponding part of the brief 80, the effect being as shown in Figure 18. The draw cord or bunching strip 82 thus acts in the manner of a purse string to gather the material of the brief at the desired spinal location. Once the desired degree of projection has been achieved, the adhesive area 90a of the pull strip tab 87 is pressed into firm adhesive engagement with the brief outer layer 81 to retain the draw cord 82 in

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its contracted configuration as seen in Figure 18. Here the contraction is accommodated by a bowing of the bow strip 83, and produces the desired projection of the material of the absorbent core of the brief 80.

In Figures 19 to 21 the diaper or brief 90 may be of the same basic construction as the other embodiments having an outer layer 91 (typically of thin flexible polyethylene material) and an absorbent core layer 92, and centrally arranged on the outer layer a strip arrangement 93 which has a central region 94 that is firmly adhered to the outer layer 91 and opposite end tabs 95, 96 forming fingerlifts, the intermediate portions 97, 98 being lightly adhered to release surfaces 99, 100 carried on the outer layer 91. At the time of use the fastening strip 93 is manipulated to provide the desired projection or bunching of the brief material in the lower spinal region of the brief as described before. To this end the end tabs 95 and 96 are manipulated to peel the associated intermediate portions 97 and 98 of the strip 93 from the adjacent release surfaces 99 and 100, and the brief material is then folded over at each side to form a respective pleat 101, 102 as seen in Figure 20. In contrast to the embodiment of Figure 8, in this arrangement the portion of the outer layer to which the tape center part 94 is attached of course remains in contact with the latter so that there is a separation between the inner folded edges of the pleats 101, 102. The brief core layer 92 is typically of a fluffed up cellulose pulp material and since it is only lightly adhered at intervals to the outer layer 91, it readily re-arranges itself to a configuration roughly as illustrated in Figures 19

and 20. It will be understood that this absorbent core layer material is very easily deformable, and can be compressed and re-shaped readily to assume the form of the area in which it is confined, e.g. the concave spinal area of the wearer. The essential point in this and in the other embodiments is that the invention provides a means for gathering a sufficient quantity of the core material of the brief into the desired spinal region to provide an adequate projection or increased thickness so that the spinal concavity of the user can be effectively filled and the possibility of leakage from the brief in this area drastically reduced.

In Figures 22 and 23 the diaper or brief 110 as before has a strip arrangement 113 centrally attached to its outer layer 111. In this case the strip 113 is of elastic material and has one end 114 bonded to the sheet 111 in a permanent manner as by the use of adhesives, heat sealing, mechanical fastening or the like, and the opposite end 115 releasably adhered to the sheet 111, the intermediate length of the strip 113 lying in contact with an elongate semi-rigid strip 116 which is affixed to the outer layer 111.

To prepare the embodiment of Figure 22 for use, the following steps are performed:

- a) The right hand end 115 of the strip 113 is detached from the outer layer 111 and peeled away from the semi-rigid strip.
- b) The brief is then manipulated to form the arched configuration as shown in Figure 3, this bending being accommodated by the bending resistance of the strip 116.
- c) The elastic strip 116 is then

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stretched and its right hand end 115 is firmly secured to the outer layer 111 in the position shown in Figure 23 to maintain the relevant area of the diaper or brief in the arched configuration shown to form a projection thereof into the concave spinal region of the wearer.

In use the elasticity of the strip 113 will maintain the strip 116 in the arched configuration and will continue to press the arched portion of the diaper formed by the strip 116 into the hollow spinal region. The strip 113 may be of any suitable elastic.

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THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE
PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. A brief comprising an outer layer of flexible
liquid-impervious material covered on the inner side by a core
layer of liquid-absorbent material that extends over the major
portion of said impervious outer layer,

said brief comprising a relatively narrow crotch
area on opposite sides of which are relatively broader front
and rear panels each of which terminates in a transverse edge
that in use forms part of a waistband of the brief, said brief
being adapted in use to snugly surround the pelvic regions of
a wearer,

said rear panel including projection means to urge a
portion of the absorbent core layer of the brief into more
intimate contact with the lower spinal region of the wearer
and thereby reduce the possibility of leakage of bodily waste
from the brief in that region.

2. A brief as claimed in claim 1 wherein said
projection means comprises:

means to locally gather the material of said core
layer in a direction generally parallel to the waistband in
the lumbar spinal region of said rear panel and thus to
increase the effective thickness of the core layer in said
region.

3. A brief as claimed in claim 1, wherein said
projection means comprises means for retaining a pleat formed

in at least said cor layer adjacent the waistband in the lumbar spinal region, whereby in that region the effective thickness of said core is substantially increased.

4. A brief as claimed in claim 1, wherein said projection means comprises means for forming two pleats in at least said core layer adjacent the waistband in the spinal region, the effective thickness of said core layer being substantially increased at each pleat.

5. A brief as claimed in claim 4, wherein said two pleats are positioned on opposite sides of but adjacent the middle of said spinal region, said two pleats being folded in opposite directions towards one another.

6. A brief as claimed in claim 3 wherein said pleat forming means comprises:

a pressure sensitive adhesive tape secured to said outer layer,

an end portion of said tape extending laterally and being secured to said outer layer in peelable and refastenable manner,

said pressure sensitive adhesive tape being so positioned to form of said pleat by said end portion of the tape being peeled away from said outer layer and re-attached to a different location on said outer layer to maintain said pleat in place.

7. A brief as claimed in claim 6, wherein said

fastening tape has two end portions as aforesaid each being peelable from said outer layer and after formation of a corresponding pleat, being refastenable thereto to maintain in place the respective pleat.

8. A brief as claimed in claim 3 wherein said retaining means comprises a tape secured to said outer layer at least one end portion of said tape extending laterally and being attached to said outer layer in peelable and refastenable manner, said tape including mechanical fastening means for attachment of the or each end portion of said tape to said outer layer.

9. A brief as claimed in claim 8 wherein said mechanical fastening means comprises a hook and loop fastener.

10. A brief as claimed in claim 6 or claim 7 wherein the or each end portion of the fastening tape has an adhesive surface that is releasably adhered to a release surface and is peelable therefrom at the time of use to enable said end portion to be securely refastened to said outer layer.

11. A brief as claimed in claim 6 adapted to form two such pleats, said fastening tape having opposite end portions that are releasably attached to first locations on said outer layer and being peelable therefrom in use and adapted to be adhered to second locations on said outer layer.

12. A brief as claimed in claim 11 wherein said

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fastening tape has a central portion that is securely fastened to said outer layer.

13. A brief as claimed in claim 1 wherein said projection means comprises a resilient bendable but substantially non-compressible element extending generally transversely in the spinal region, and pulling means on the outer side of said element and acting between the two ends thereof to apply to said element an inwardly bowed configuration.

14. A brief as claimed in claim 1 wherein said projection means comprises a bunching strip extending in said brief in a transverse direction and operable in the manner of a purse string to bunch the spinal portion of said absorbent core layer.

15. A brief as claimed in claim 1 wherein said projection means comprises elastic means applied in stretched condition to the rear panel of the brief at a spacing below the waist band part thereof, said elastic means being adapted to gather or bunch the material of said absorbent core in the lumbar spinal region of the rear panel.

16. A brief as claimed in claim 15 wherein said elastic means is arranged so as to contract in a direction parallel to the waist band of the brief.

17. A brief as claimed in claim 15 wherein said elastic

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means comprises a tape having at least one end portion releasably engaged with a corresponding release surface on said outer layer, said end portion being peelable from said release surface to be adhered to a laterally spaced portion of said rear panel to place said elastic means in a stretched condition.

18. A brief as claimed in claim 17 wherein said tape overlies a semi-rigid strip which is fixed to said outer layer, said strip and the associated portions of the diaper being bendable into an arched configuration, said at least one end portion of the tape when adhered to said laterally spaced portion of the rear panel being effective to maintain said arched configuration of said strip.

19. A brief as claimed in claim 17 wherein said at least one tape end portion includes mechanical fastening means for attachment thereof to said outer layer.

20. A brief as claimed in claim 19 wherein said mechanical fastening means comprises hook and loop fastener means.

21. A brief as claimed in claim 17 wherein said at least one tape end portion includes a pressure sensitive adhesive coating which is adapted to effect attachment of said end portion to said outer layer.

22. A brief as claimed in claim 17 wherein said elastic

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means is provided in two portions arranged at opposite sides of a central portion, the central portion being fixedly attached to said outer layer in a central position thereon.

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PATENT AGENTS

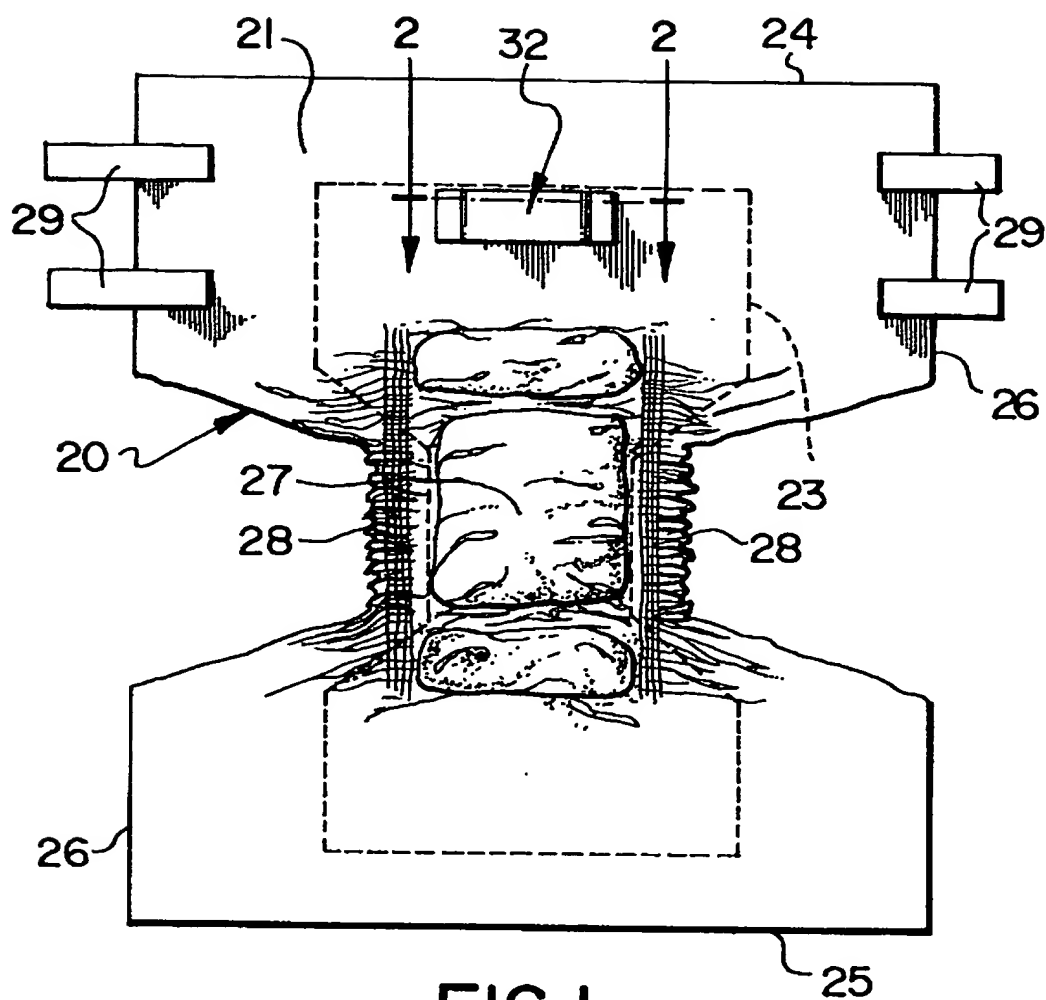


FIG. 1

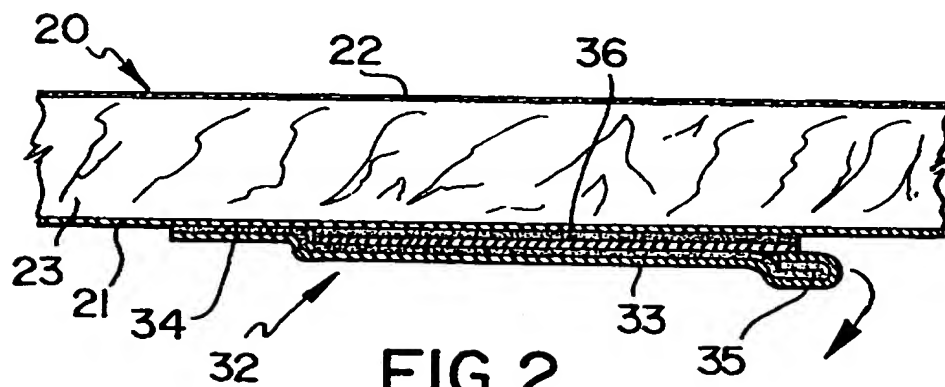
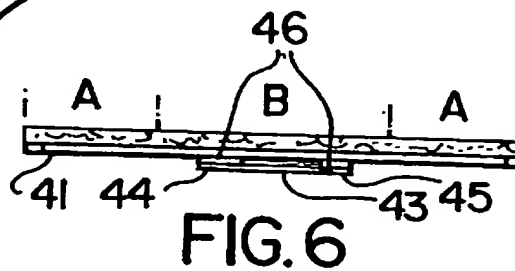
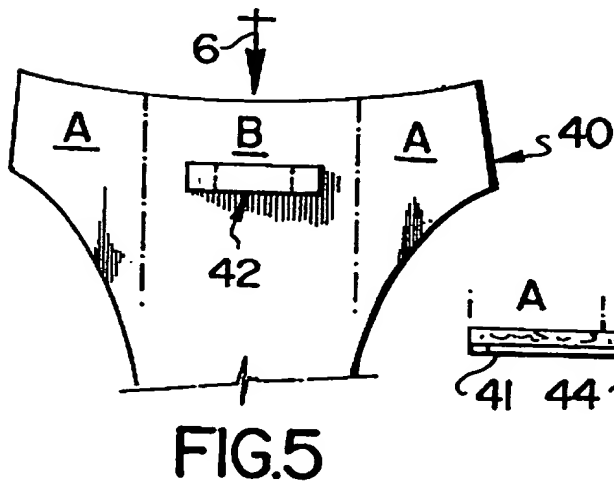
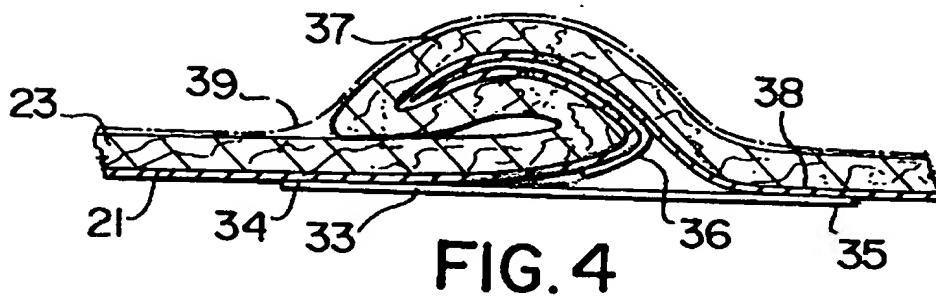
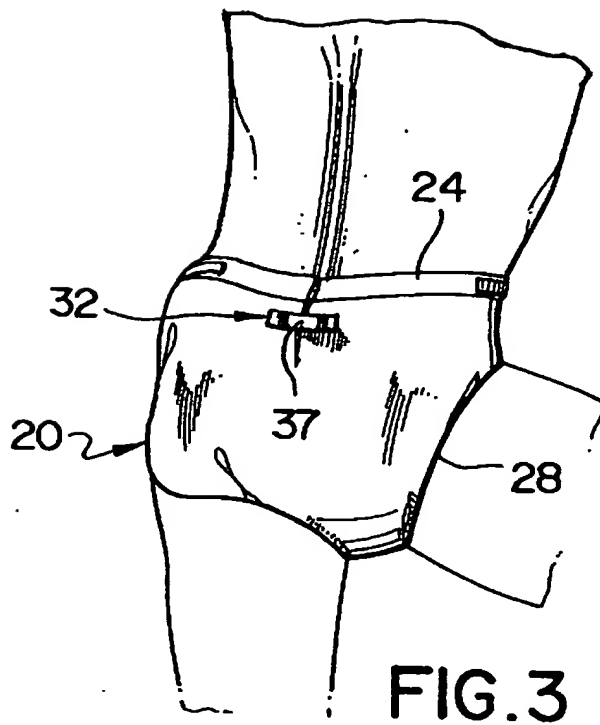


FIG. 2



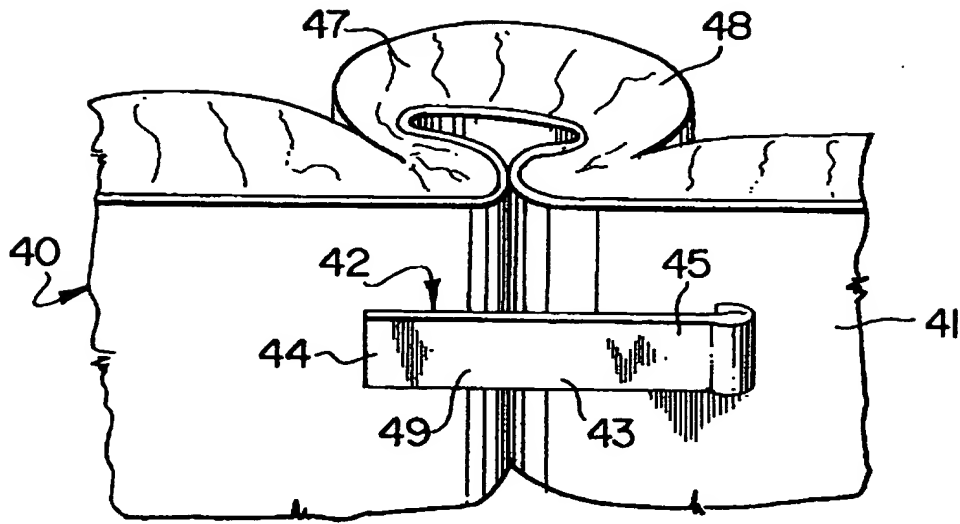


FIG. 7

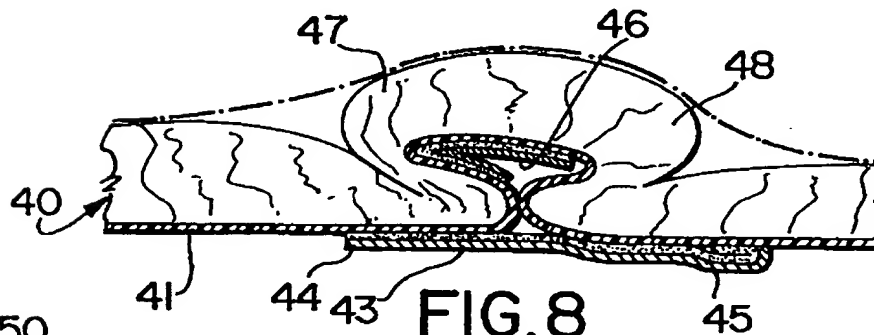


FIG. 8

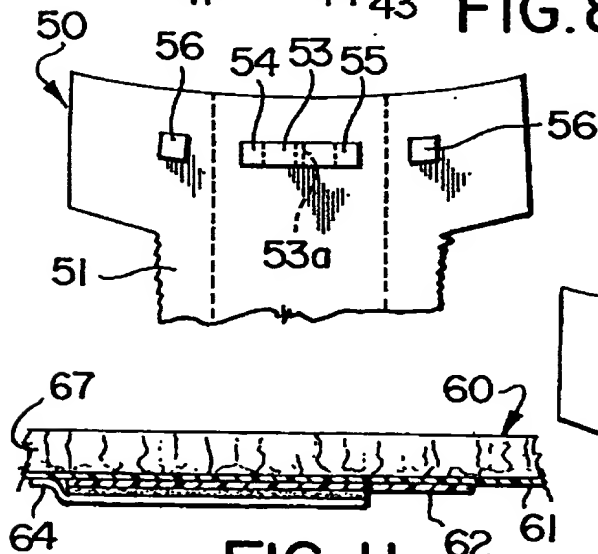


FIG. 9

FIG. 10

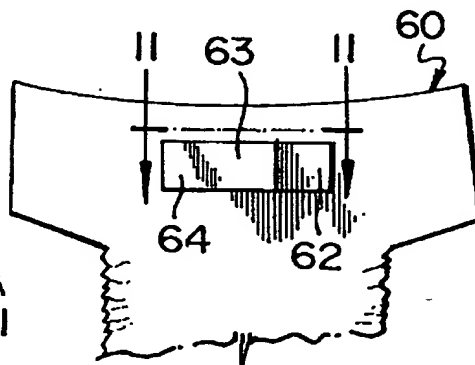
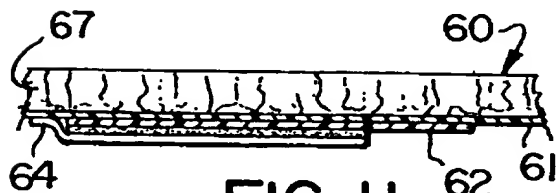
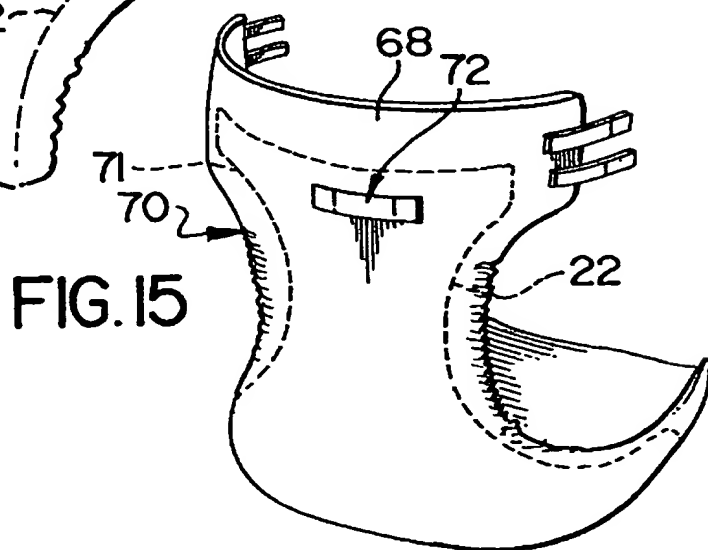
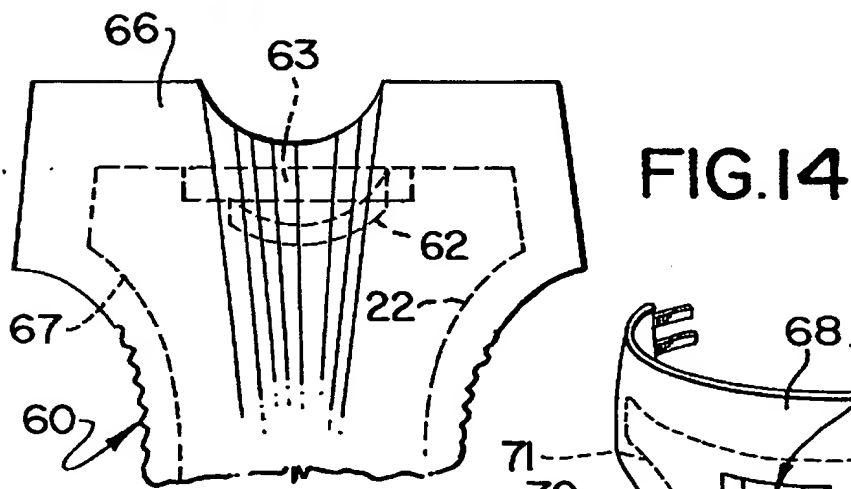
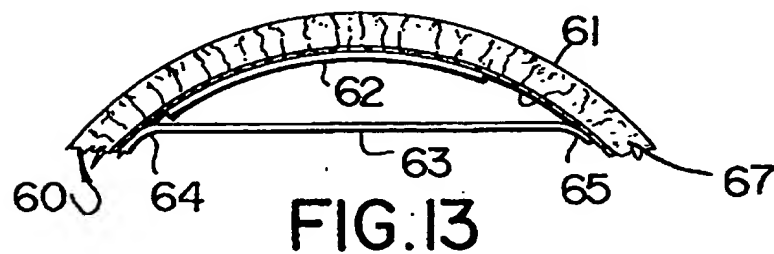
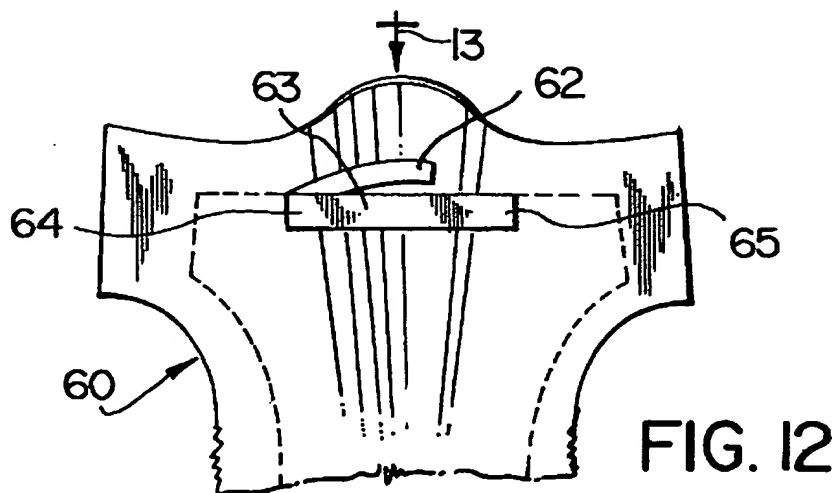


FIG. 11





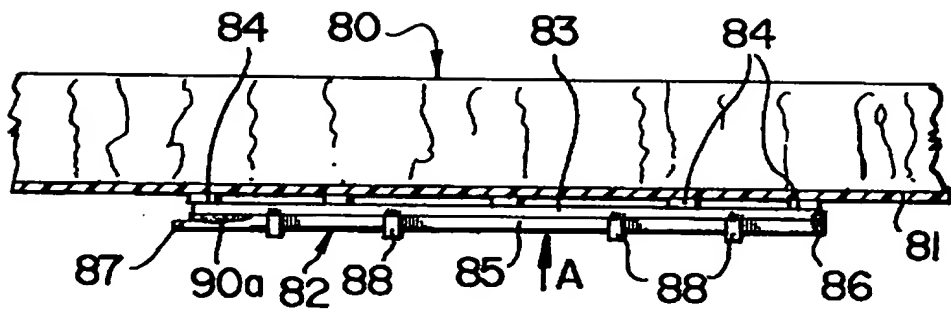


FIG. 16

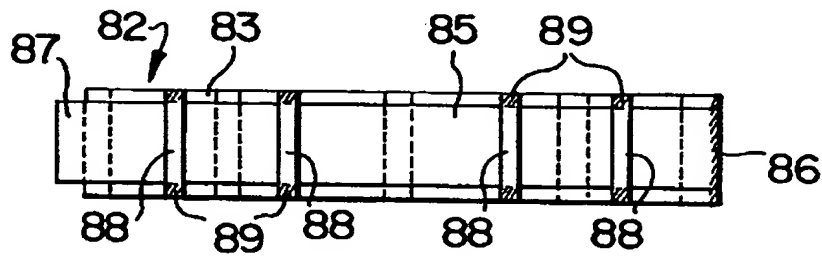


FIG. 17

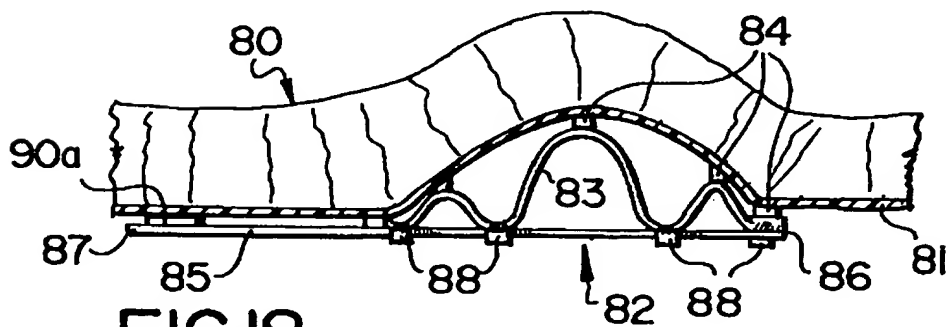


FIG. 18

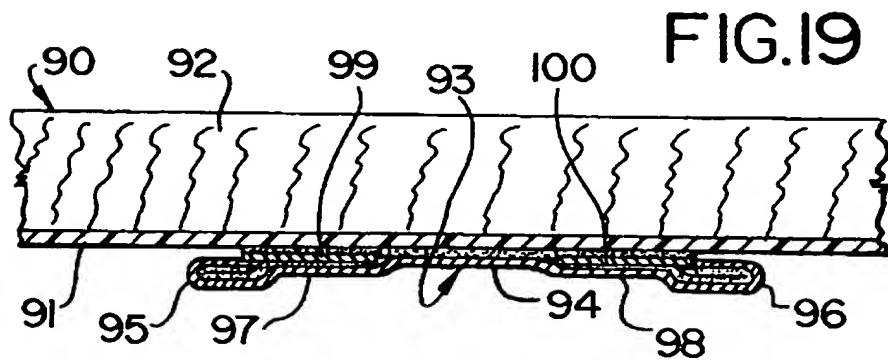


FIG. 19

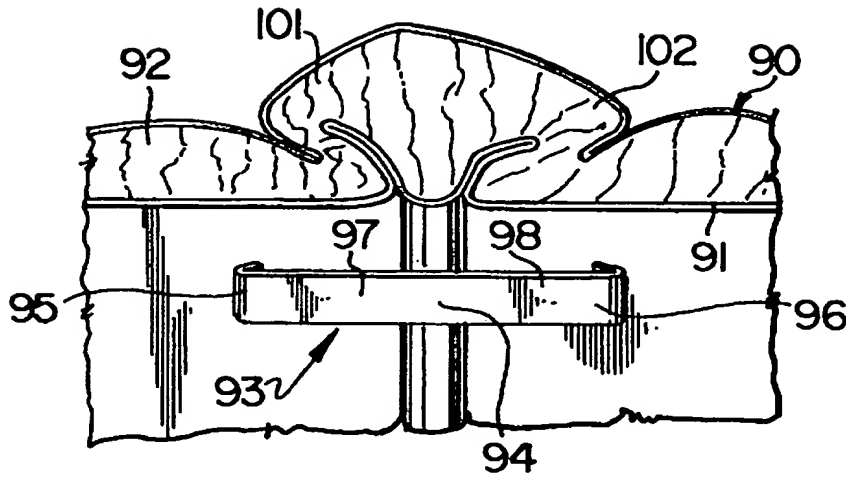


FIG. 20

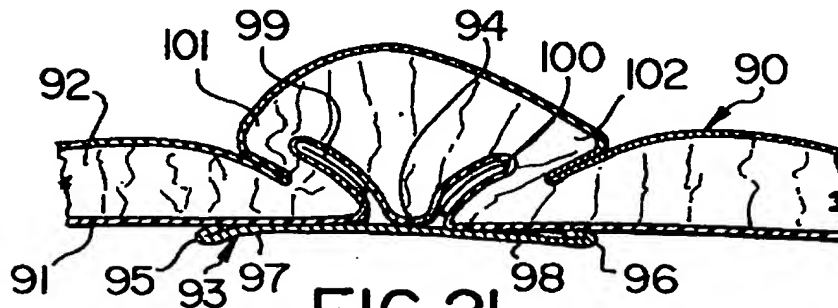


FIG. 21

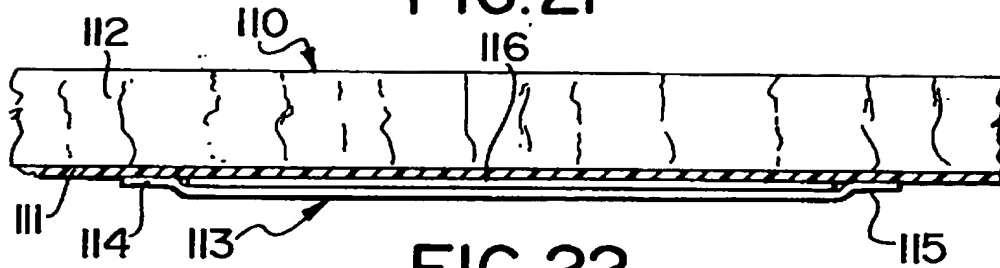


FIG. 22

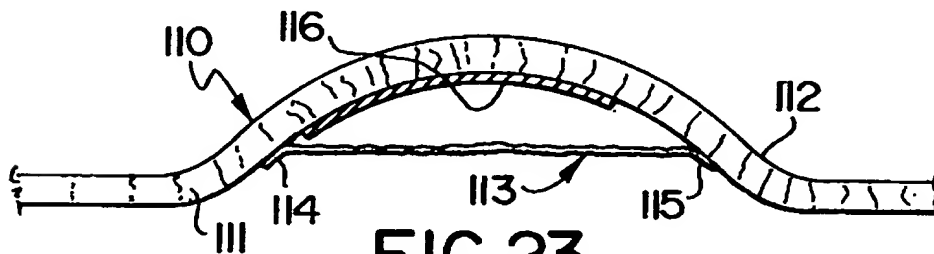


FIG. 23